USACHPPM
Readiness thru Health

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Just the Facts...

# *Formaldehyde - Deployment Occupational and Environmental Health Concerns*

In recent Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) rotations there have been several reports of eye, nose and throat irritation among Soldiers living and working in newly constructed plywood buildings. Industrial hygiene hazard assessments identified formaldehyde as the most likely source. The assessment showed formaldehyde concentrations above normal background levels and were directly attributed to plywood building materials. The following information is provided to help minimize Soldier exposure to formaldehyde in newly constructed plywood buildings.

## Formaldehyde: What is it and where does it come from?

Formaldehyde is a colorless, strong-smelling gas commonly used as a preservative. It is used in medical laboratories, mortuaries, and is found in building materials such as glue in adhesives, oriented strand board (OSB), fiberboard, and plywood. Formaldehyde is also found in tobacco products, and as an incomplete combustion by-product of wood fires. It is also found in plastics, glue, carpet cleaners, lacquers, and many every day personal use products.

## Summary of OIF/OEF Assessments and Findings

An industrial hygiene survey for formaldehyde was conducted in April 2005; investigations have found that on operating bases in Iraq and Afghanistan, building materials are procured from sources outside the United States where the amount of formaldehyde contained in the wood is not regulated. When these building materials are used, the formaldehyde gets into the air (called off-gassing) inside the structures and exposes Soldiers to levels that could cause minimal to significant health effects. The U.S. EPA estimated the mean indoor air concentration is 0.03 ppm in conventional homes and higher in mobile homes because of their lower air turnover. Sampling conducted in newly constructed plywood buildings at two separate military bases in Iraq revealed levels of formaldehyde in air up to 0.97 ppm. The individual results show there are exposures above the Military Exposure Guideline (MEG)* criterion (see table below), but the incidents of the exposures are rare. In addition, the formaldehyde inside these structures will decay and exposures will lessen with time.

| 1 - Hour Air-MEG (ppm) Health Effect Level | | | 8-hour Air-MEGs (ppm) | 1-14 Day Air-MEGs (ppm) | 1-Year Air-MEGs (ppm) |
|---|---|---|---|---|---|
| Minimal | Signifcant | Severe | | | |
| 1 | 10 | 25 | 0.3 | 0.3 | 0.2 |

** The Department of the Army published MEGS for several chemicals in air during deployments (USACHPPM TG 230, May 2003). The MEGs were developed to better characterize and understand chemicals in a deployment environment in terms of their potential risk to the mission and overall force health protection.*

*U.S. Army Center for Health Promotion and Preventive Medicine*
*Industrial Hygiene Field Services Program (IHFSP)*
*5158 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010-5403*
*410-436-3118 or DSN 584-3118*
*http://chppm-www.apgea.army.mil/ihfs/*

## Potential Health Effects

The most common acute effect of formaldehyde is irritation of the eyes, nose and throat. Some people are very sensitive to formaldehyde in the air and may sense the irritation at very low levels. Others may experience headaches, trouble concentrating, and/or other nonspecific symptoms. At high enough levels, the irritation can turn into damage of the lining of the respiratory tract, similar to acid mists, these levels were not found.

Some people develop an allergic reaction to formaldehyde on repeated exposure and this can show itself as skin rashes/eczema; swelling of the face; red, itchy eyes; runny nose; and possibly chest tightness/asthma.

Animals that are exposed long term have shown a tendency to develop cancer of the lining of the nose, where the formaldehyde first contacts. Although human studies have not clearly shown the same tendency, the Environmental Protection Agency (EPA) and other federal regulatory agencies have classified formaldehyde a possible carcinogen and recommend keeping exposures as low as possible.

## Recommendations

The following are strategies to minimize the health risk and to reduce the exposure to formaldehyde:

- Purchase building materials with lower levels of formaldehyde. Only buy plywood or particle board with the U.S. Department of Housing and Urban Development stamp, or an Engineered Wood Association standard PS-1 stamp.

If wood cannot be purchased from the above sources, follow these strategies:

- For wood purchased on the economy (locally), allow it to "bake off" outside for four weeks in the sun prior to using it. Stacking the wood vertically, like in a drying rack and allowing ambient air ventilation between layers would be most effective. In addition, shield the wood products from the rain by placing a tarp over the top of the drying rack ensemble.
- Apply a high gloss water-based paint, or a fast-drying latex primer sealer, such as Kilz®, then ventilate with 100% outdoor air using fans during construction.
- With any of the above strategies, allow four weeks of ventilation using 100% outdoor air prior to occupancy of newly-constructed buildings.

## For More Information:

Consumer Product Safety Commission: http://www.cpsc.gov/cpscpub/pubs/725.html

U.S. Environmental Protection Agency: http://www.epa.gov/iaq/largebldgs/pdf_files/sec_7.pdf

Occupational Safety and Health Administration (OSHA):
http://www.osha.gov/OshDoc/data_General_Facts/formaldehyde-factsheet.pdf

Chemical Exposure Guidelines for Deployed Military Personnel (TG 230), U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM):
http://chppm-www.apgea.army.mil/documents/TG/TECHGUID/TG230.pdf